[0035] In the next stage of operation, as shown in FIG. 6, the anvil 26 controllably moves towards the gathering block upon the actuation of the air piston and cylinder unit 28 to stop at a small distance from a surface 50 of the gathering block. An amount of air pressure stored in the memory 40 of the CPU 38 may control the displacement of the anvil. Similarly to the controllable displacement of the gathering block, in addition to the controllable air pressure, a sensor (not shown) may be installed to signal the end of the travel. As a result of such displacement, the wire nest containing at least one vertical column of the wires to be spliced is fully enclosed by surfaces 50, 52, 20 and 44 of the gathering block 30, anvil 20, tip guide 12, and the welding tip 18, respectively.

[0036] Subsequent to forming the wire nest, as shown in FIG. 7, the anvil 26 and the tip guide 12 move vertically downward, as indicated by arrow C, to reduce the size of the wire nest. This displacement is controlled by the CPU 38 to exert a predetermined pressure, as is stored in the memory 40, upon the stack of wires. Additional pressure sensors 54 shown diagrammatically and connected to the CPU 38 control the exerted pressure so it would be within a desirable range providing a high efficiency weld.

[0038] As a result of welding, the wires as shown in FIG. 8 are spliced and posses hydraulic pressure so to remove the spliced wires from the wire nest the gathering block 30, anvil 26 and tip guide 12 are retreated to a position shown in FIG. 9. After a predetermined period of time controlled by the CPU and sufficient for an operator to remove a slice 46 (FIG. 10), the gathering tool is displaced back to stop at the predetermined distance from the tip guide, as shown in FIG. 5. This period can last

up to 5 seconds which allows the operator to remove the slice 46 and his/her hands before the gathering tool moves back to the initial position defining a predetermined width of the wire nest, as illustrated in FIG. 11. The gathering block and the anvil may start moving away from the wire nest either simultaneously or, preferably, sequentially by first retreating of the gathering block, and then moving the anvil 26 away from the nest.

[0039] During repeated use of the ultrasonic welding process, both the horn 22 and the tip 18, as shown in FIGS. 12-14 are exposed to substantial wear as a result of the ultrasonic vibration which generates a substantial amount of heat leading to premature failures of the tip and horn. To overcome this problem, the tip 20 has a pair of spaced apart holes 60, each of which has a continuous concentric pad 62, better seen in FIG. 14, that receives a respective bolt 64 fastening the tip 18 to an end face of the horn 22. As a consequence, focusing the ultrasonic vibration in a close proximity to the bolt holes 60 by efficiently transmitting ultrasonic vibration through the pads 62 kept intact with the horn by means of the concentrated clamping force of the bolts. The extended surfaces of the tip provided with work surfaces 20 are free to vibrate without harm to the horn or welding tip, which improves productivity and quality of the weld as well as durability of the vibrating parts of the apparatus.

[0040] As shown in FIG. 13, the welding tip has four serrated work surfaces (only two are shown), three of which are auxiliary to form a new welding surface upon exhaustion of the previously used surface by simply rotating the tip 18 around the horn 20.

[0041] Although the invention has been described with reference to a particular arrangement of parts, features and the like, these are not intended to exhaust all possible arrangements or features, and indeed many other modifications and variations will be ascertainable to those of skill in the art.